

REMARKS

Claims 1-18 are currently pending in this application.

Claims 19-28 have been withdrawn, due to a restriction requirement.

Claims 1-18 have been rejected on various grounds. The Applicants respectfully traverse these rejections as they apply to the amended claims and request reconsideration.

Claim 2 has been amended.

Drawings

The drawings were objected to on the basis that they fail to show the connection between the retainer, boot and booster charge holder as described in the specification.

The Applicants submit that the drawings, especially when all drawings are considered together, does show the connection between the retainer, boot and booster charge holder as described in the specification. Figs. 2 and 3 show the details of the booster charge holder. Figs. 4 and 5 show the details of the boot. Fig. 6 shows details of the retainer that is used in Fig. 1. Fig. 1 shows these parts assembled with the large end 64 of the boot inserted within the lower chamber 36 of the booster charge holder and the retainer 46 threaded onto the threads 62 of the booster charge holder and engaging the shoulder 68 of the boot to hold it in the booster charge holder. The assembly instructions provided in paragraphs 38 and 39 together with the Figures make these connections very clear.

Formal drawings are submitted with this response.

Claim Rejections – 35 USC § 112

Claim 2 was rejected under 35 USC § 112 because the limitation “upper sealing surface” was not clear. Claim 2 has been amended to make it clear that it is the “firing head upper sealing surface” that is adapted to form a fluid and pressure seal with a wireline firing sub. This

amendment is supported by Fig. 1 and par. 23 that make it clear that the O-rings 22 on the firing sub 18 make a fluid tight pressure seal with the upper end of the firing head 10.

Claims 3-7 were rejected under 35 USC § 112 as being indefinite. Specifically the Examiner notes that claim 3 requires outer and inner surfaces “sized to form a fluid tight seal”. The Examiner asserts that it is unclear how the size of a device relates to its ability to seal.

The Applicants submit that the meaning of “sized to form a fluid tight seal” is clearly spelled out in the specification, e.g. in paragraphs 26, 31, 34, 36, 38 and 39. In Par. 38 it is noted that the inner surface of the boot 44 is sized to fit tightly on the detonating cord and must be stretched to some extent to fit over the cord. In Par. 39, it is noted that the large tapered end 64 of the boot 44 is sized for a tight fit into chamber 36 and must be forced in, with the use of grease suggested to facilitate the process. The process applies compressional force on the boot 44 forming a fluid resistant seal between the detonating cord, the boot and the inner surface of the chamber 36. The cap 36 or 80 should be tightened to apply compressional force to the shoulder 68 of boot 44 to maintain the fluid tight seal.

The specification and drawings make it clear that the boot should be sized so that it must be compressed to fit between the booster charge/detonating cord and the inner surface of the chamber 36. That is, the size must be somewhat larger than the space between the charge/detonating cord and the inner surface of the chamber 36 so that the boot will be in compression when forced into that space. The retainer cap 36 applies and maintains compression forces in the boot to maintain the seal.

Claim Rejections – 35 USC § 102

Claims 1-4 have been rejected under 35 USC § 102(b) as being anticipated by US Patent 4,998,477 issued to Barker.

With reference to claim 1, the Examiner asserts that Barker discloses a firing head 14 having a chamber housing a detonator 15 and having an upper sealing surface (via O-rings 13) and a lower sealing surface (at the end opposite O-ring 13); that Barker discloses a booster charge holder 16 having an upper sealing surface (at 12 [21?]) and a lower sealing surface (at opposite end of the shoulder 12 [22?]); and that the booster charge includes a bulkhead 45 and a booster charge chamber containing booster charge 14 [41?]. The Applicants disagree with the Examiner's reading of Barker.

In Fig. 2, Barker does not provide a lower sealing surface on the detonator housing 14 and does not provide an upper sealing surface on the booster charge holder 16. Without these sealing surfaces Barker cannot provide a pressure seal between the booster charge holder 16 and the detonator housing 14. At col. 4, lines 29-40, Barker makes it clear that the shoulder 21 on the charge holder 16 is abutted against the locking shoulder 22 for registering, i.e. properly positioning, the various parts. Barker never says that there is a seal, either pressure or fluid, between these parts. At col. 4, lines 26-28, Barker says that the boot 18 seals against fluid intrusion, but never says it provides a pressure seal. At col. 5, lines 17-24, Barker says that the structure is fluid tight, but does not say it is pressure tight.

As noted in par. 36 of the present application, the alternative retainer cap of Figs. 7 and 8 may be preferred to protect the entire outer surface of the boot 44 in wells where gases such as methane may cause the boot 44 to swell and lose strength and possibly allow borehole fluids to flow between the detonating cord and the boot 44. In the Barker device, the entire boot is exposed to borehole fluids that may cause it to swell, weaken and leak. If such leakage occurs in the device of Barker and fluid gets inside the boot 18, there is no other seal to prevent that fluid from flowing

into the housing 14 and affecting the detonator 15. This is a problem that the present invention was intended to solve.

In Claim 1 the detonator chamber has true pressure and fluid seals on both upper and lower ends. The booster charge holder has an upper sealing surface that forms a pressure and fluid tight seal with the detonator chamber lower sealing surface. The boot of Barker provides, at best, a fluid seal, but does not seal against pressure. As noted at col. 2, lines 3-4 of Barker, the barrier, or bulkhead, is for the express purpose of confining the detonating cord. It must be confined because the boot does not prevent borehole pressure from being applied to the detonating cord and extruding it into the detonator chamber. Barker does not provide a pressure and fluid seal at the lower end of the detonator chamber. If fluid gets inside the boot of Barker, e.g. in a well with methane, pressure will cause that fluid to flow into the detonator chamber and can damage the detonator.

In view of these substantial differences, the Applicants submit that claim 1, and its dependent claims 2-18 are allowable over the cited reference.

With reference to claims 3 and 4, the Examiner asserts that Barker discloses a seal boot 18 having first and second ends and inner and outer surfaces and that either end or surface work in conjunction to seal the inner area of the detonator system.

Barker's boot does not have an outer surface sized to form a fluid tight seal with an inner surface of a booster charge holder. Barker does not teach forming a seal between the outer surface of boot 18 and any other element. Barker's system does not have an inner surface in a booster charge holder with which a boot could form a seal.

The boot arrangement of the present invention has several advantages over the boot arrangement of Barker. In the present invention, the boot forms seals on both its inner and outer

surfaces, and in the process is protected from exposure to borehole fluids. In the present invention, the boot can be placed in compression by being forced between the booster charge and the booster charge holder. The compression of the boot provides a positive fluid seal.

In view of these substantial differences, the Applicants submit that claims 3 and 4, and claims that depend from them, are allowable over the cited reference.

Claim Rejections – 35 USC § 103

Claims 5-x were rejected under 35 USC § 103(a) as being unpatentable over Barker as discussed above and in view of alleged well established case law regarding obviousness. The Examiner asserts that Barker teaches a retainer located within a boot, both operating to seal the interior of a detonator chamber with the boot sealingly attached to the firing head. The Examiner asserts that the claims are directed to a configuration in which the retainer and boot are merely reversed, but which achieves the same result in the same way; i.e. the boot interacts with the retainer to seal the inside. Finally, the Examiner asserts that it would have been obvious to reverse the parts.

Applicants submit that the claimed configuration is not obvious and does not achieve the same result in the same way. As discussed above, the claimed configuration places the boot in compression to form a positive fluid seal. The retainer retains the boot and therefore the booster charge in position and provides compression to form the positive seal. The positioning of the boot between the booster charge holder, the booster charge and the retainer protects the boot from borehole fluids that could cause the boot to swell, lose strength and leak.

In contrast the Barker system does not teach or suggest any method for compressing the boot to form a positive fluid seal. Barker's retainer retains only a booster charge holder and does

not provide any sealing function. Barker does not provide any protection for the outer surface of the boot, either by the retainer or the booster charge holder.

In view of the substantial advantages and new functions that result from the claimed arrangement, the Applicants submit that claims 5-x are allowable over the references and principles of obviousness.

Summary

In view of the above remarks, the Applicants submit that the claims 1-18, as amended, are now allowable and respectfully request allowance of claims 1-18.

The Commissioner is hereby authorized to charge payment of any further fees associated with any of the foregoing papers submitted herewith, or to credit any overpayment thereof, to Deposit Account No. 50-1515, Conley Rose, P.C.

If the Examiner has any questions or comments or otherwise feels it would be helpful in expediting the application, he is encouraged to telephone the undersigned at (972) 731-2288.

Respectfully submitted,
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